

Wireless In-situ Nondestructive Inspection of Engine Rotor Disks with Ultrasonic Guided Waves, Phase I

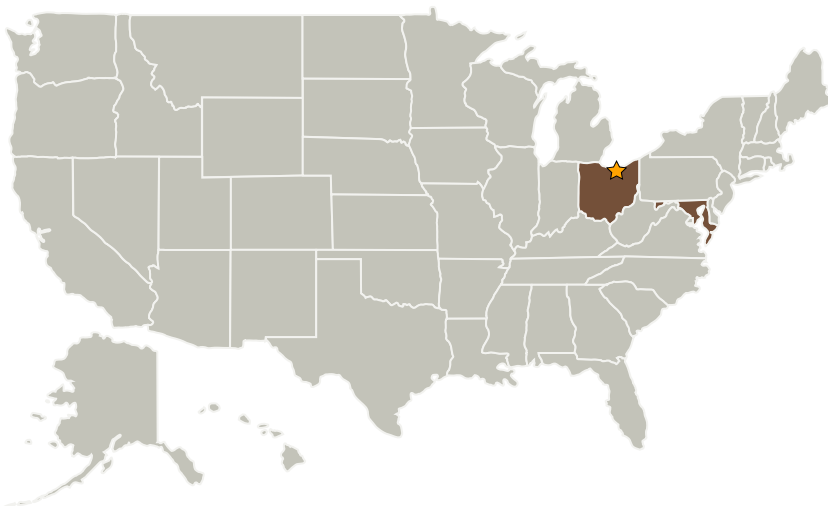
Completed Technology Project (2006 - 2006)



Project Introduction

The integrity of rotor disks in engine turbines or fans is vital to aviation safety. Cumulative cracks at critical loading and high stress areas, if not detected and repaired in time, can lead to a catastrophic failure. Traditional inspection methods such as Fluorescent Penetrant Inspection (FPI) and Eddy current are point-by-point methods and very time consuming. Disassembly of the engine is needed for each inspection, which may generate more problems. We propose a wireless in-situ ultrasonic guided wave health monitoring approach that can eliminate all the disadvantages of conventional methods. It applies light, thin ultrasonic guided wave circumferential patch transducers around the root of the disk. Guided waves travel in the radial direction and can inspect the whole disk area. The electrical signal is coupled wirelessly to the circumferential patch through a pair of RF antennas mounted on the rotor shaft and a stationary fixture around the shaft, respectively. The inspection can be done even when the disk is rotating. The envisioned system has minimal impact to the rotor performance, can instantaneously provide reliable and quantitative data such as crack location and severity level, can minimize and eventually eliminate the need for structural disassembly, and is able to communicate wirelessly for in-situ engine health monitoring.

Primary U.S. Work Locations and Key Partners



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Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Organizational Responsibility	1
Project Management	2
Technology Areas	2

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Intelligent Automation, Inc.	Supporting Organization	Industry	Rockville, Maryland

Primary U.S. Work Locations

Maryland	Ohio
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX13 Ground, Test, and Surface Systems
 - └ TX13.2 Test and Qualification
 - └ TX13.2.3 Non-Destructive Inspection, Evaluation, and Root Cause Analysis